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and geographical distribution of the various sorts. The book is full of good information put in an attractive style and should find abundant welcome.—O. W. CALDWELL.

MINOR NOTICES.

THE THIRD FASCICLE of "Illustrations de la Flore du Congo," by Wildeman and Durand, has just appeared, containing twelve plates, with descriptive text. The plates are exceedingly handsome, and their number has now reached thirty-six.—J. M. C.

A NEW classification of the Leucobryaceæ is proposed by M. Jules Cardot in *Revue Bryologique* **26**: 1–8. *pl. 1.* 1899. It is based chiefly upon the anatomical characters of the leaves as shown by cross-sections, such as the presence or absence of sclereides, and the form and arrangement of the chlorophyllose cells.—C. R. B.

SOME RESEARCHES of Loeb upon the influence of alkalies and acids upon embryonal development and growth[7] led to results which may have important applications to the growth of plants. He finds that weak alkalies (even .006% NaHO) accelerate the development and growth of larvæ of Arbacia (a sea-urchin) and the embryos of Fundulus (a fish), while weak acids retard. The cause of these actions is to be sought in the effect of the reagents on the oxidative processes of the protoplasm.—C. R. B.

NOTES FOR STUDENTS.

GEORGE J. PEIRCE has been studying the nature of the association of alga and fungus in lichens.[8] Speaking of the algae he says that "it is neither logical nor sensible to conclude that their unusual position is beneficial to them," as free algæ can thrive, at least for a time, wherever lichens can. "There is no proof that algal cells serving as lichen gonidia are any better off as to food, protection, or situation than the average free algal cells of the same species." Of course the fungus is found to be absolutely dependent upon the alga. The author also affirms that the central body of the gonidial cells of Ramalina, Usnea, and Sphærophorus, is a nucleus, not a pyrenoid.—J. M. C.

HERMANN VON SCHRENK[9] has been investigating a disease of *Taxodium* known as peckiness, and also a similar disease of *Libocedrus decurrens*. In both cases the wood is destroyed in localized areas, which are surrounded by wood apparently sound. In both, also, a fungus mycelium was found, which flourishes within the diseased centers, but no characters appeared by which it could be determined. It is interesting to note the fact that these two trees, similarly affected, are the representatives of a race largely extinct, and grow in different parts of the country.

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[7] Archiv f. Entw.-mechanik der Organismen 7:631–641. *pl. 1.* 1898.

[8] Proc. Calif. Acad. Sci. III. 1 : 207–240. *pls. 41.* 1899.

[9] Eleventh Ann. Rep. Mo. Bot. Gard. 1–55. *pls. 6.* 1899.

The same author (*op. cit.* 6–70) has also discovered a peculiar sclerotioid disease of beech roots. Small tubercles were found attached to the fibrous roots, and upon examination these were found to be a twisted and contorted mass of rootlets invested by a sheath. It was impossible to determine the fungus, but it seemed probable to the author that it is distinct from those forming the mycorhiza.—J. M. C.

MESSRS. FARMER and WILLIAMS have continued their contributions to the life-history and cytology of the Fucaceæ by publishing a second paper[10] which deals with the development of the oogonia and oospheres, the phenomena of fertilization, and the early segmentation stages of the oospore, especially in the genera Fucus, Ascophyllum, and Pelvetia. The more interesting subjects discussed are the reduction in the number of chromosomes, the appearance and behavior of centrospheres and centrosomes, the formation of the walls of the oogonia, oospheres, and germinating oospore, and the part played by mucilage in bringing about the extrusion of the oospheres.

The reduction of chromosomes occurs in the papilla which is cut off to form the rudiment of an oogonium. This was also shown by Strasburger to be the case in Fucus. In the three successive mitoses by which the eight oosphere nuclei are formed, the reduced number of chromosomes is retained. Prominent centrospheres in the form of converging cytoplasmic radiations are present in every mitosis, whether of the oogonium or segmenting oospore. These could not be traced back to preexisting centrospheres, but appeared to arise independently by the activity of the protoplasm, and to disappear again after the mitosis. Though the centrospheres are cytoplasmic, the spindle between them is intranuclear in origin. Centrosome-like structures were sometimes seen within the centrospheres, but their number was not constant. There was no indication that the centrospheres of the first oosporic division are derived from the spermatozoid.

So few cases of polyspermy were observed that it is certain but one spermatozoid normally enters an oosphere. The existence of a wall around the newly fertilized eggs was conclusively demonstrated; such eggs burst when transferred from salt water to fresh, whereas unfertilized eggs similarly treated merely swell up but do not burst.

Some interesting features with regard to fertilization were observed in Halidrys. Groups of gyrating spermatozoids were seen distributed over the surfaces of the oospheres, each attached by one cilium. Suddenly the spermatozoids leave the egg "like a crowd of startled birds," the egg at the same time becoming covered with conical projections. The authors consider this phenomenon as marking the moment of fertilization, and as a proof of a definite repulsion of the supernumerary spermatozoids.—WILSON R. SMITH.

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[10] Phil. Trans. Roy. Soc., London, B. **190**: 623–645. 1898.

ALTHOUGH the morphology of the embryo sac is still a very live subject, it is well to study its physiological relations, as has been done by Mlle. Goldflus in the ovules of a large number of Compositae. She discusses especially the function of the antipodal cells and of the so-called epithelial layer.[11]

It is well known that, after the rupture of the nucellus, the embryo sac in this family lies in contact with the epidermis of the inner portion of the ovule. The cells of this layer frequently become enlarged and beautifully columnar, and for this reason Hegelmaier called the layer the "endodermis," ascribing to it a protective function. Schwere, without committing himself in regard to its function, changed the name to "endothelium." The author revives the term "epithelium," previously used by Warming and Goebel, assigning to the layer a digestive function, as did Guignard.

The antipodal cells, variable, as usual, both in number and size, are said to be digestive in some plants, and in others, conductive in function. Their densely staining protoplasm and their tendency to burrow back into the "pseudo-chalazal" region are cited in support of this view. Moreover, the cells of the inner part of the integument are arranged in rows converging from all sides toward the sac, this structure being well adapted for the conduction of nutriment to the embryo sac and its embryo.

The author has evidently fallen into the error of supposing that, because the *function* of the antipodal cells is now discovered, the view of Strasburger and others regarding their *homology* is no longer tenable. One would naturally expect a prothallial region of a gametophyte to nourish the reproductive region, even to digesting the food if necessary. Hence the two theories, instead of being mutually hostile, are in perfect harmony. Would the author say that the "epithelial layer" is not epidermis, merely because it has here a special function, that of digestion ?

In reviewing the article by Chamberlain on *Aster Novae-Angliae*, the author rightly challenges an unguarded suggestion about a "macrospore in an unusual position," but closer reading would have shown that he was merely comparing the free nuclear division in the large antipodal cell with the same process in a macrospore; and it would also have become evident that he was not confounding the two terms "oosphere" and "macrospore."

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[11] GOLDFLUS, MLLE. MATHILDE : Sur la structure et les fonctions de l'assise épithéliale et des antipodes chez les Composées. Journ. de Botanique **12** : 374–384. 1898; **13** : 9–17, 49–59, 87–96. 1899.

We cannot help wishing that the author had given complete drawings of some of the more striking ovules, such, for example, as *Dahlia gracilis,* with the cell contents accurately shown. When a point is proven "by the appearance of the protoplasm, and the distribution of starch and other foods in the ovule," one quite naturally expects in the drawings definite delineation. In this, however, the six plates are sadly lacking.

The author has touched an important and suggestive field. Results from a comparative study of other groups ought to be easily accumulated from the many permanent preparations of ovules and embryo sacs in the possession of various botanists, which might repay reexamination from this new point of view.— W. D. MERRELL.